REMARKS

Claims 12-46 are pending in the case, and the Applicants respectfully request reconsideration of these claims.

Claims 12, 13, 18-21, 26-30, 35-38, 43, 44 and 46 were rejected as obvious over Sedra in view of Fagg. In particular, the Examiner alleged that Sedra teaches various features cited on pp. 4 and 5 of the Office Action. In particular, the Examiner stated that:

> "The oscillator feedback loop of Sedra generates sinusoidal oscillations. It is inherent that oscillations have 'amplitude, phase and a frequency.) a first spike Page 5 generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal **(Sedra,** fig 12.10, p. 986 through p. 988; 'First spike generation circuit' of applicant maps to "high - Q bandpass filter' of Sedra."

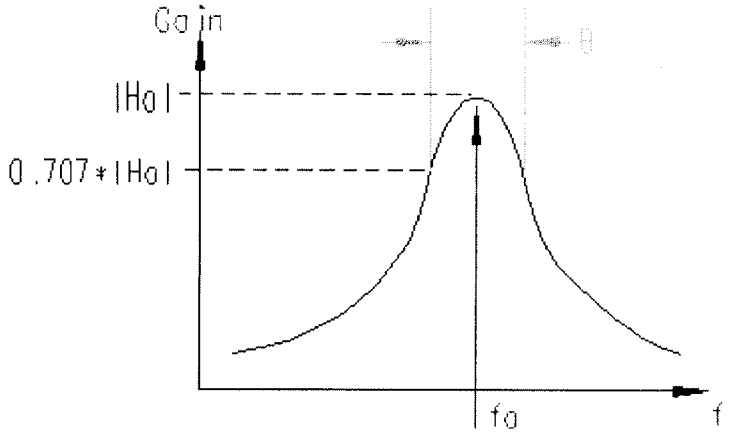
Firstly, there is, in fact, no spike generation circuit in Sedra in either Fig. 12.10 or pp. 986-988 since a high Q bandpass filter is not a spike generation circuit. Rather such a high Q bandpass filter only acts to remove high and low frequencies outside a band width defined by a transfer function, H(s). The following is taken from website www.swathmore.edu/NatSci/echeevel/Ref/FilterBkgrnd/Filters.html which defines a well known High-Q bandpass filter:

High Q (Low Bandwidth) Bandpass Filters.

For a second-order band-pass filter the transfer function is given by

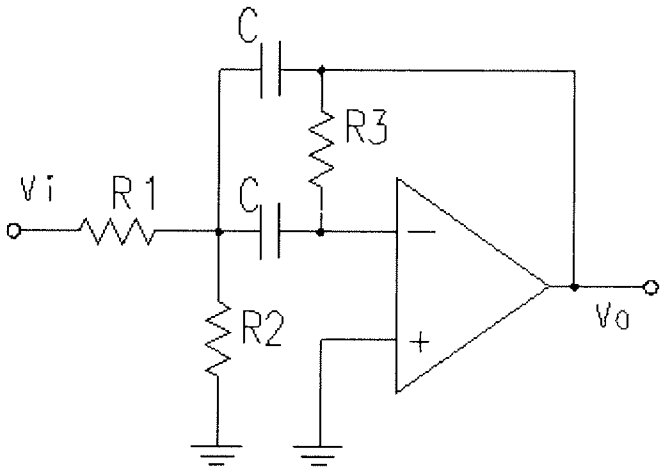
$$H(s) = \frac{V_o}{V_i} = \frac{H_o \beta s}{s^2 + \beta s + \omega_o^2}$$

where ω_o is the center frequency, β is the bandwidth and H_o is the maximum amplitude of the filter. These quantities are shown on the diagram below. The quantities in parentheses are in radian frequencies, the other quantities are in Hertz (i.e. $f_o=\omega_o/2\pi$, $B=\beta/2\pi$). Looking at the equation above, or the figure, you can see that as ω–>0 and ω->infinity that $|H(s=j\omega)|$–>0. You can also easily show that at $\omega=\omega_o$ that $|H(s=j\omega_o)|=H_o$. Often you will see the equation above written in terms of the quality factor, Q, which can be defined in terms of the bandwidth, β, and center frequency, ω_o, as $Q=\omega_o/\beta$. Thus the Q, or quality, of a filter goes up as it becomes narrower and its bandwidth decreases.



If you derive the transfer function of the circuit shown below:

High-Q Bandpass Filter with Op Amp



you will find that it acts as a band-pass filter with:

$$H_o = -\frac{R_3}{2R_1}$$

and the center frequency and bandwidth given by:

Radian frequency	Hertz
$\omega_o = \frac{1}{C\sqrt{(R_1 \| R_2)R_3}}$	$f_o = \frac{\omega_o}{2\pi}$
$\beta = \frac{2}{CR_3}$	$B = \frac{\beta}{2\pi}$

The notation $R_1 \| R_2$ denotes the parallel combination of R_1 and R_2,

$$R_1 \| R_2 = \frac{R_1 R_2}{R_1 + R_2}$$

Consequently returning now to explaining patentable distinctions over Sedra in view of Fagg, such a high-Q bandpass filter cannot reasonably be understood by one of ordinary skill in the art to perform as a spike generation circuit as set forth in Applicants' specification and drawings. In particular, paragraphs [0061] which discuses Fig. 3, [0078] and Fig. 5, [0079] and Fig. 6, [0080] and Fig. 6, [0088] and Fig. 10 and Fig. 11, a spike generation circuit is described and the outputs shown. Such a spike generation circuit, which would produce the claimed features, is not found in Sedra nor is such a circuit even suggested in Sedra.

Secondly, the Examiner asserted Sedra teaches a second spike generation circuit; but as noted above, Sedra teaches only a high-Q bandpass filter which is not a spike generation circuit, as reasonably and fairly understood by one of ordinary skill in the art. In view of this distinction alone, all the Applicants' claims includes this distinction and therefore all claims are patentable over Sedra. The Fagg reference does not remedy these deficiencies of Sedra, and consequently the combination of Sedra and Fagg does not render any of the Applicants' claims obvious.

The Examiner further asserted on p. 6 of the Office Action that "Fagg teaches phase." The "delayed sensory signals" of Fagg are not the phase of oscillation as set forth in the important combination of features in Applicants' claims. Further all of Applicants' independent claims 12, 20, 28, 29 and 37:

> "wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit to thereby adjust one of the amplitude, phase and frequency of the oscillation output signal."

Clearly, the Applicants' invention includes an "oscillation output signal" which in combination with a first spike signal and second spike signal form a composite signal for controlling an actuating element and the control circuit adjusts one of amplitude, phase and frequency of the output signal. Fagg teaches no such feature nor even suggests such a combination of elements. Rather, Fagg teaches on p. 2, left column:

> "Errors in cerebellar-generated movements are assessed by the inferior olive (IO), and are measured in muscle space. This is accomplished indirectly by observation of muscle length changes in response to the corrective motor commands generated by the EC module. The IO-generated signals are then used to update the APGs contained within the cerebellar module."

Thus Fagg teaches that the sensory signals used to update the adjustable pattern generators (APGs) are information about errors in movements measured in muscle space. Fagg does not teach or disclose inferior olive (IO)-generated signals as having anything to do with phase much less teach the combination of elements set forth above regarding "oscillation output signal". Fagg further teaches, "The contributions of the two control modules are combined in the spinal/muscle system, which transforms muscle space signals into joint torques." Thus, neither the inputs nor the outputs of the APGs are phase. Fagg does not even teach, disclose or even suggest phase of oscillation. Fagg's delayed sensory signals relate to errors in movement in muscle space which are transformed into joint torques. This is not phase of oscillation as in Applicants' claims and is not adjusting phase of oscillation as is claimed. Fagg also never even suggests phase or phase of oscillation, and Fagg's delayed sensory signals are not phase or phase of oscillation, much less any teaching or understanding of the need to control phase, frequency or amplitude as in Applicants' independent claims. Clearly, therefore, Fagg does not teach

oscillation much less phase of oscillation. Finally, further Fagg has no teaching or suggestion of an APG maintaining a phase characteristic of a (composite) output signal of a (first) control circuit relative to a phase characteristic of a (composite) output of a (second) control circuit.

In view of these additional important distinctions over Fagg, independent Claims 12, 20, 28, 29 and 37 and all dependent claims are patentable over Sedra in view of Fagg.

Claims 14-17, 22-25, 31-34 and 39-42 were rejected as obvious over Sedra in view of Fagg as applied hereinbefore to Claims 12, 13, 18-21, 26-30, 35-38, 43, 44 and 46 and further in view of Nekorkin. As noted previously neither Sedra nor Fagg teach or even suggest a spike generation circuit nor "phase," as well as the other combination of elements described above and as set forth in all of Applicants' independent claims. The Nekorkin reference does not remedy any of these deficiencies in Sedra or Fagg regarding the features in the independent claims; and therefore, all pending claims are patentable over Sedra in view of Fagg and Nekorkin.

The Applicants respectfully request reconsideration and allowance of pending Claims 12-46.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of

papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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